

CLAIMS:

1. An infrared radiation element comprising:

- 5 a semiconductor substrate;
- a porous heat insulating layer formed on a surface of said semiconductor substrate, said heat insulating layer having smaller thermal conductivity than said semiconductor substrate;
- 10 a heating layer formed on said heat insulating layer and emitting infrared rays by being energized, said heating layer having larger thermal conductivity and electric conductivity than said heat insulating layer.

2. The infrared radiation element as set forth in claim 1, wherein

- said semiconductor substrate is a silicon substrate,
- 15 said heat insulating layer and said heating layer each being a porous silicon layer, said heating layer having smaller porosity than said heat insulating layer.

3. The infrared radiation element as set forth in claim 2, wherein

- the porosity of said heating layer is 2-45%,
- 20 a porosity of said heat insulating layer being 40-80% and being more than 10% larger than the porosity of said heating layer.

4. The infrared radiation element as set forth in claim 2, wherein

- said heating layer is doped with an impurity so that the electric conductivity
- 25 becomes higher than that of the silicon substrate and its temperature coefficient of resistance becomes positive.

5. The infrared radiation element as set forth in claim 1, wherein

- said heating layer is formed by a carbon layer given conductivity.

6. The infrared radiation element as set forth in claim 1, wherein said heating layer is formed by an amorphous silicon layer given conductivity by impurity doping.

5 7. The infrared radiation element as set forth in claim 6, wherein said amorphous silicon layer has a higher doping concentration on a surface side than on a heat insulating layer side.

8. The infrared radiation element as set forth in claim 1, wherein
10 many concavities and convexities are formed in a surface of said heating layer.

9. The infrared radiation element as set forth in claim 1, wherein multiple layers for restricting a wavelength band of the infrared rays emitted to the outside are piled on a surface of said heating layer.

15 10. The infrared radiation element as set forth in claim 1, wherein a reflection coating is piled on an opposite surface of said semiconductor substrate, said reflection coating reflecting, to a heating layer side, the infrared rays emitted from said heating layer toward a semiconductor substrate side.

20 11. The infrared radiation element as set forth in claim 1, wherein a thermal insulating member having smaller thermal conductivity than said semiconductor substrate is provided on an opposite surface of said semiconductor substrate.

25 12. The infrared radiation element as set forth in claim 1, wherein said heating layer is formed on said heat insulating layer through an insulating layer having smaller electric conductivity than said heat insulating layer.

30 13. A gas sensor comprising:

an infrared radiation source for emitting infrared rays in a predetermined space;

a light receiving means for receiving said infrared rays;

a control means for judging presence or absence of a target gas based on
5 an output of said light receiving means by using absorption of the infrared rays of the target gas;

wherein

said infrared radiation source is the infrared radiation element as set forth
in claim 1.